Thank you, Craig. Good morning, everyone. I'm **Martin** Jeffries, Principal Editor of the Arctic Report Card and a Program Officer for Arctic and Global Prediction at the Office of Naval Research. I'm pleased to welcome you today to the official release of the 2014 update to the Arctic Report Card.

This is the eighth annual update to the Report Card, which was first published in 2006. This year's Report Card is the work of a large international team of authors: 63 scientists from 13 different countries. All ten essays in this year's Report Card were subject to independent peer-review organized by the Arctic Monitoring and Assessment Programme (AMAP) of the Arctic Council. The Report Card is published online, where key highlights from the essays and a video that summarizes Report Card 2014 can be seen on the front page of the Web site.

So, what do we have to report about the Arctic environmental system this year? **Jackie?**

In 2014 we continued to see the impacts of a persistent warming trend that began over 30 years ago and which overlies significant year-to-year and regional variations. Central to the story are Arctic air temperatures, which continue to increase at a rate of warming

that is more than twice as fast as at lower latitudes. This well-documented effect is called ‘Arctic Amplification’ of global warming. In early 2014, the warming Arctic atmosphere was strongly connected to lower latitudes as the polar vortex weakened and the waves in the jet stream became more pronounced. Consequently, cold air moved southward into eastern North American and central Russia, while warm air flowed northward into Alaska and northern Europe. Alaska recorded temperature anomalies more than 10 degrees Celsius (18 degrees Fahrenheit) higher than the January average.

Responding to the persistent warming air temperatures, snow cover extent across the Arctic during spring of 2014 was below the long-term average of 1981-2010. A new record low extent was set in April in Eurasia, and North America’s June snow extent was the third lowest on record. Snow disappeared three to four weeks earlier than normal in western Russia, Scandinavia, the Canadian sub-Arctic and western Alaska due to below average accumulation in winter and above normal spring temperatures.

The extent of sea ice in September 2014 was the 6th lowest since satellite observations began in 1979, and the eight lowest sea ice

extents since satellite observations began in 1979 have occurred in the last eight years (2007-2014).

Interestingly, the rate of reduction Northern Hemisphere snow cover extent in May and June now exceeds the rate of summer sea ice loss, and snow extent and sea ice extent have been highly correlated since the mid-1990s.

As sea ice retreats in summer, sea surface temperature in all the marginal seas of the Arctic Ocean is increasing. This trend is most apparent in the Chukchi Sea, northwest of Alaska, where sea surface temperature is increasing at a rate of 0.5 degrees Celsius per decade. In August 2014, in the Laptev Sea north of Russia, and in the Bering Strait region between Russia and Alaska, where sea ice retreated relatively early, sea surface temperature was as much as 4°C higher than the 1982-2010 average.

Larger regions of open water can also be linked to increases in production at the base of the food web, due to the increased amount of solar radiation available for photosynthesis, and the availability of nutrients. In June, July and August 2014 the highest primary production values occurred in the Kara and Laptev seas north of Russia. The timing of phytoplankton blooms throughout

the Arctic Ocean is also being affected by the loss of sea ice, with more frequent secondary blooms during the autumn.

As **Geoff** will explain to us now, there is growing evidence that polar bears are also being affected by changing sea ice cover.

Indeed, in areas where we have long-term data, there are troubling signs for both polar bears and other animals that depend on the ice cover for survival. For example, between 1987 and 2011 in western Hudson Bay, Canada, a decline in polar bear numbers, from ~ 1,200 to ~ 800, can be linked to earlier sea ice break-up, later freeze-up and, thus, a shorter sea ice season. In the southern Beaufort Sea, where there are now twice as many ice-free days over the continental shelf as there are immediately to the west in the Chukchi Sea, adult polar bear numbers stabilized at ~900 by 2010 after a ~40 percent decline since 2001. The survival of young bears in the southern Beaufort Sea also declined between 2001 and 2010. In contrast, polar bear condition and reproductive rates in the Chukchi Sea may be stable at present- reflecting greater productivity of that system, fewer ice free days over the continental shelf, and a possible rebound from significant harvest in the mid-90’s.

Martin: Thanks Geoff. On land, there is additional evidence of the impact of the persistent warming trend. Peak tundra greenness, a measure of vegetation productivity and biomass, continues to increase. Between 1982 and 2013, the tundra biomass increased by 20 percent.

On the Greenland ice sheet, melting occurred across almost 40 percent of the surface in summer 2014, and for 90 percent of the summer, the extent of melting was above the long-term average for the period 1981-2010. Also, the number of days of melting in June and July exceeded the 1981–2010 average over most of the ice sheet. In August 2014, the reflectivity (albedo) of the ice sheet, which affects the surface energy balance and melting, was the lowest observed since satellite observations began in 2000.

The Arctic is not without its mixed signals, however, due largely to the effects of year-to-year and regional variations. For instance, at the time of maximum sea ice extent in March 2014, there was evidence of a modest increase in the age of the ice and its thickness relative to March 2013. On land, where tundra peak greenness continues to increase, tundra greenness integrated over the entire summer has been decreasing in Eurasia – a so-called ‘browning trend’ and shortening of the growing season -

since 1999, where summer air temperatures happen to have been decreasing. Perhaps most surprising was that the total mass of the Greenland ice sheet remained essentially unchanged between 2013 and 2014.

So, how to sum up the current state of the Arctic environmental system?

The impacts of the persistent warming trend of over 30 years remain clearly evident in the land and ocean environments, and these impacts are influencing the Arctic marine and terrestrial ecosystems. Given consistent projections of continued warming temperatures, we can expect to see continued widespread and sustained change throughout the Arctic environmental system.

But we won't see those changes if we don't at least maintain and sustain our current long-term observing capabilities. Indeed, if we're to understand how this complex environmental system works, improve predictions of what is likely to happen in the future, and identify appropriate responses to the anticipated changes, we need to ***add*** to our observing capabilities. Observations are fundamental to Arctic environmental awareness, government and private sector operations, scientific research, and

science-informed decision-making as required, for example, by the U.S. National Strategy for the Arctic Region.

Before we close, I'd like to acknowledge the work of a number of people who are vital to the success of the Arctic Report Card. First, the authors who generously volunteer their time and expertise in preparing the essays. Second, our first ever Editorial Advisory Board, which helps us identify essays topics and authors, and assists with the internal review. Third, Nancy Soreide and Tracey Nakamura who prepare the Report Card Web site hosted at the NOAA Pacific Marine Environmental Laboratory (PMEL) in Seattle. And, last but not least, I'd like to thank my co-editors, Jackie Richter-Menge of the Cold Regions Research and Engineering Laboratory in Hanover, New Hampshire, and Jim Overland of NOAA PMEL.

That concludes the 2014 update to the Arctic Report Card. I'll now open this session to questions. Thank you.